

REMARKS

Applicant acknowledges the Examiner's allowance of claim 36, and the Examiner's indication that claims 5, 21 and 33 contain allowable subject matter. Applicant also acknowledges the Examiner's removal of two previously applied references, U.S. patent 4,261,955 to Bailey, Jr. et al. and U.S. patent 4,155,712 to Taschek, and the reopening of prosecution.

The Examiner has objected to claims 10, 34 and 36 for the reasons stated in the Office Action. It is respectfully submitted that the objections have been overcome by the instant amendment. Claim 36 is hereby amended to indicate "Previously Presented" status as the Examiner requires. Claims 10 and 34 are hereby amended to change the phrase "at least one device" to "at least one valve" as the Examiner requires. It is respectfully submitted that each of the Examiner's objections are now overcome.

Claims 15, 17 and 31 stand rejected under 35 U.S.C. 112, first paragraph, for the reasons stated in the Office Action. It is respectfully submitted that the rejection to claim 17 has been overcome by the instant amendment. Claim 17 has been amended to specify that porous plugs are a type of valve. Particularly, a porous plug is a type of fixed valve that provides a fixed resistance to the diffusion of water vapor. It is respectfully submitted that claim 17 is a proper limitation on the scope of the "at least one valve" recited in claim 1, and is accordingly properly supported by the disclosure on page 5, lines 22-25, page 10 lines 4-7, original claim 17 and Figure 1. For these reasons it is submitted that the rejection has been overcome.

It is further respectfully submitted that the rejection of claims 15 and 31 are not well taken. The Examiner asserts that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors had possession of the claimed invention at the time the application

as filed. The Examiner states specifically that the specification does not indicate the simultaneous presence of two or more elements selected from a valve, a pump and a porous plug. Applicant respectfully asserts that Fig. 1 as originally filed provides sufficient support to satisfy the written description requirement, wherein both a pump 22 and porous plugs 24 are simultaneously contained in a power generator of the invention, and as discussed herein, porous plugs are a type of fixed valve.

According to MPEP § 2163.02, an objective standard for determining compliance with the written description requirement is, "does the description clearly allow persons of ordinary skill in the art to recognize that he or she invented what is claimed." *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). The test for sufficiency of support in a patent application is whether the disclosure of the application relied upon "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)). An applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed invention (emphasis added). *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997). Possession may be shown in a variety of ways including description of an actual reduction to practice, or by showing that the invention was "ready for patenting" such as by the disclosure of drawings that show that the invention was complete (emphasis added). See, e.g., *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 68, 119 S.Ct. 304, 312, 48 USPQ2d 1641, 1647 (1998).

Accordingly, Fig. 1 supports an embodiment having both a valve and a pump and no new matter is present. The requirements of 35 U.S.C. 112, paragraph 1, are thereby satisfied. For the foregoing reasons, it is respectfully requested that the rejection be withdrawn.

The Examiner has rejected claims 1-4, 6, 9-12, 15, 18, 22-26, 28-31, 34, 35 and 37-39 under 35 U.S.C. 102(b) over U.S. patent 5,372,617 to Kerrebrock et al. It is respectfully submitted that the rejection has been overcome by the instant amendment. The claims have been amended to specify that the power generator is maintained at a temperature of from about -20°C to about 50°C during operation. This is neither taught nor suggested by Kerrebrock, et al.

Kerrebrock, et al. teaches a very different power generator than that taught by Applicant. Kerrebrock teaches a hydrogen generator for undersea vehicles powered by a fuel cell that requires the manufacture of high levels of electricity in order to be useful for its intended purpose. Their hydrogen generator operates by introducing either liquid water or steam into a vessel that is loaded with a hydride, which hydride is then hydrolyzed to generate hydrogen gas. This generated hydrogen gas is then reacted at a fuel cell with oxygen supplied from a stored oxygen supply. As described in col. 8, lines 36-39, water is supplied to the chamber at a rate of approximately 4.5 ml/min per 1 kW of electrical power produced by the fuel cell, based on a fuel efficiency of 60 percent.

In order to generate sufficient electrical energy to power their undersea vehicle, the system taught by Kerrebrock, et al. requires both high operating temperatures and pressures in order to deliver gaseous water in the form of steam. Specifically, Kerrebrock discloses at col. 9, lines 30-35 an operating temperature range of from about 175°C to 250°C using their preferred hydride, with approximately 200°C being the optimal temperature. This is a significant distinction compared to the non-steam water vapor reactant used in the present invention which is present at a temperature of from about -20°C to about 50°C.

While "water vapor" and "steam" are both forms of water, each has very different properties and uses. For example, a locomotive can be driven by steam, but will not operate on the water vapor present in humid air, as does the present invention. In and of itself, "water vapor" is the gas of individual water molecules that forms naturally over any

body of water at any temperature, including ice. It has a low partial pressure, so it contains relatively few water molecules unless the water that forms it is heated. On the other hand, "steam" is made up of tiny hot water droplets produced by heating water to boiling. Steam contains about 100x more water molecules than does water vapor at 15°C, naturally expands with high force and velocity, and large amounts of water can be boiled and transported off as steam. Water vapor is present in everyday air and contains a much smaller number of water molecules than steam or liquid water, and moves very slowly by natural diffusion. Only very small amounts of water can be transported in the form of water vapor. To illustrate, a single drop of water takes typically one hour to evaporate at room temperature, while an entire kettle of water can be boiled into steam in about twenty minutes.

Kerrebrock describes pumping and injecting liquid water into a chamber containing a hydrogen producing fuel. The generated hydrogen gas then reacts in a fuel cell with a stored supply of oxygen gas to form electricity. Kerrebrock also teaches adding heaters to boil their liquid water to form steam as it is injected, because steam produces less clogging of their fuel (still injecting the same water, simply boiling it as it goes in). Thus, Kerrebrock also requires a heater to if he wants to boil the water. Kerrebrock does not teach the use of room-temperature water vapor, because they could not possibly generate enough power to drive an undersea vehicle by reacting a hydride with water vapor at -20° to 50°C. The present invention is a power generator for relatively low output power levels that do not need a large number of water molecules to react with the hydrogen fuel, with a sufficient number of water molecules present in the form of naturally-present water vapor, available from the natural force of diffusion moving the water. At operating temperatures of from about -20° to 50°C, a water vapor results in the production of much less electricity. To make an analogy, whereas the present invention is akin to a double A battery, Kerrebrock's invention is more like a power station generator, big and heavy, with pumps, heaters, paddles and motors generating a lot of power.

In contrast to Kerrebrock, the presently claimed invention uses the water vapor that forms naturally over a water reservoir to generate hydrogen gas. This hydrogen gas then reacts in a fuel cell with natural oxygen from the air to generate about 3 volts and about 1 mA of current, very similar to a single AA battery. The small amount of water that would be available through such water vapor as described by Applicant could not possibly produce any significant power by Kerrebrock's standards, compared to that from the liquid water or steam. Specifically, their power generator is only useful with the large quantity of water molecules available from liquid water or the amount of water boiled into steam. Accordingly, Kerrebrock does not teach a hydrogen generator that operates at from about -20°C to 50°C, and the hydrogen generator of Kerrebrock would not produce sufficient hydrogen gas to be satisfactory for its intended purpose using only water vapor at temperatures of from about -20°C to 50°C. It is therefore respectfully submitted that Kerrebrock, et al. does not teach or suggest the claimed invention.

Claims 35, 37, 38 and 39 stand rejected under 35 U.S.C. 102(b) over U.S. patent 6,093,501 to Werth. It is respectfully submitted that the rejection has been overcome by the instant amendment. Similar to Kerrebrock, et al., Werth neither teaches nor suggests a power generator that is maintained at a temperature of from about -20°C to about 50°C during operation. Specifically, Werth teaches a method of generating hydrogen gas by passing liquid water or steam at 230°C to 250°C over activated iron in the presence of a catalyst (see col. 3, lines 27-33; col. 5, lines 1-6.). This hydrogen gas is then generated into electricity in a fuel cell. While Werth does not teach the use of water vapor wherein the power generator maintained at a temperature of from about -20°C to about 50°C, they also teach away from low-temperature iron-water reactions, specifying that with a decrease in temperature, substantial larger amounts of iron reactant are required to generate enough hydrogen for their purposes (see col. 2, lines 18-37). Only by the addition of a catalyst are they able to operate their power generator at "relatively low temperatures, such as about 250°C" using a reasonable quantity of iron. Much like Kerrebrock et al., the power generator of Werth could not possibly transport enough water molecules in the form of water vapor at -20°C to 50°C to generate the power levels

they describe to be satisfactory for their intended purpose. It is therefore respectfully submitted that Werth does not teach or suggest the claimed invention.

The Examiner has rejected claims 13 and 14 under 35 U.S.C. 103(a) over Kerrebrock et al. in view of U.S. patent 6,358,488 to Suda. It is respectfully submitted that the rejection has been overcome by the instant amendment.

Kerrebrock et al. has been discussed above and those arguments are repeated herein. Suda describes a method for the generation of hydrogen gas by the reaction of a solid metal hydrogen complex compound in an aqueous alkaline solution, such as a 10% aqueous solution of sodium or potassium hydroxide, with a catalyst. The Examiner applies Suda to show that suitable catalysts include cobalt, nickel, ruthenium and alloys and combinations thereof. It is respectfully submitted that the disclosure of Suda is insufficient to overcome the differences between the claimed invention and Kerrebrock et al. Applicant respectfully asserts that a combination of Suda and Kerrebrock et al. would not teach or suggest the claimed invention to one skilled in the art, and one of ordinary skill in the art would not be able to arrive at the presently claimed invention with a reasonable expectation of success upon a reading of Kerrebrock along with Suda. For these reasons it is respectfully submitted that the rejection is overcome and should be withdrawn.

The Examiner has rejected claims 19, 20 and 32 under 35 U.S.C. 103(a) over Kerrebrock et al. in view of U.S. patent 5,942,344 to Lehmeier et al. It is respectfully submitted that the rejection has been overcome by the instant amendment.

Kerrebrock et al. has been discussed above and those arguments are repeated herein. The Examiner has cited Lehmeier et al. to show that it would be obvious to include a heater with the claimed power generator to heat the fuel cell of the claimed invention. Lehmeier et al. discloses a high-temperature fuel cell system having a heating element for heating a fuel cell. Particularly, Lehmeier et al. teach a fuel cell system that is specifically

directed to high-temperature uses having an operating temperature of at least 900°C. This is in direct contrast to the claimed invention which describes a low-temperature electrical power generator that has a temperature of from about -20°C to about 50°C during operation. It is respectfully submitted that the heater disclosed by applicant serves simply to maintain the power generator in this low-temperature range.

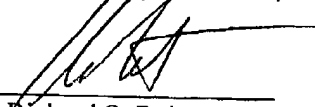
Applicant respectfully asserts that one skilled in the art would not look to combine the high-temperature heater of Lehmeier, et al. with the power generator of Kerrebrock, et al. to arrive at the presently claimed invention. More importantly, the disclosure of Lehmeier, et al., particularly the disclosure directed to heating a fuel cell, is insufficient to overcome the differences between the claimed invention and Bailey, Jr. et al. The suggest combination of references would not teach or suggest the claimed invention to one skilled in the art, and one of ordinary skill in the art would not be able to arrive at the presently claimed invention with a reasonable expectation of success upon a reading of Bailey, Jr. et al. along with Lehmeier, et al. For these reasons it is respectfully submitted that the rejection is overcome and should be withdrawn.

Other than Kerrebrock et al., the references cited by the Examiner each certainly show the individual components, as well as one or more of the individual steps used in the instant processes. However, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). It is further asserted that operating either Kerrebrock et al. or Werth within Applicant's operating temperature range would change the principle of operation of both Kerrebrock and Werth and would require a substantial reconstruction and redesign of the elements shown therein, as well as a change in the basic principle under which the references' constructions were designed to operate. It is therefore respectfully submitted that the

claimed invention as amended is neither taught nor suggested by the applied references, either alone or in combination.

The undersigned respectfully requests re-examination of this application and believes it is now in condition for allowance. Such action is requested. If the examiner believes there is any matter which prevents allowance of the present application, it is requested that the undersigned be contacted to arrange for an interview which may expedite prosecution.

Respectfully submitted,



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I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office, FAX No. (703) 872-9306 on February 9, 2005.



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